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08/520,079	08/28/1995	SHUNPEI YAMAZAKI	740756-001400	1321
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NIXON PEABODY, LLP			KIM, JAY C	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 08/520,079	Applicant(s) YAMAZAKI ET AL.
	Examiner JAY C. KIM	Art Unit 2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(o).

Status

1) Responsive to communication(s) filed on 03 November 2008.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 87,88,90-92,123,124,126-128,137,143 and 149 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
 5) Claim(s) ____ is/are allowed.
 6) Claim(s) 87,88,90-92,123,124,126-128,137,143 and 149 is/are rejected.
 7) Claim(s) ____ is/are objected to.
 8) Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 28 August 1995 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. ____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date ____

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date ____.
 5) Notice of Informal Patent Application
 6) Other: ____

DETAILED ACTION

This Office Action is in response to the Amendment filed November 3, 2008.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 87, 88, 90-92, 123, 124, 126-128, 137, 143 and 149 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Regarding claims 87 and 123, Applicants disclosed in the Specification that "nickel is detected at a concentration of 1×10^{17} to 5×10^{17} cm⁻³ from the TFTs in the peripheral driving circuits" and "at a concentration of the limit of measurement (1×10^{16} cm⁻³) or less from the TFT of the pixel circuit". However, Applicants did not originally disclose that a first thin film transistor provided in a matrix pixel circuit including nickel at a concentration of 1×10^{17} to 5×10^{17} cm⁻³, and a second thin film transistor provided in a peripheral driving circuit including nickel at a concentration of 1×10^{16} cm⁻³ or less as recited in claims 87 and 123. Claims 88, 90-92, 137 and 149 depend on claim 87, and claims 124, 126-128 and 143 depend on claim 123, and therefore claims 88, 90-92, 124, 126-128, 137, 143 and 149 also fail to comply with the written description requirement.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 87, 88, 90 and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura (US 5,534,716).

Regarding claims 87, 88 and 90, Takemura discloses a semiconductor device (Fig. 4F) comprising a first thin film transistor (transistor formed in region 111 shown in Fig. 4C) provided in a matrix pixel circuit (col. 6, lines 12 and 48-49) over a substrate (101) (col. 6, line 16), and a second thin film transistor (transistor comprising gate 115 in region 110) provided in a peripheral driving circuit (col. 6, lines 10-12 and 48-49) over the substrate (101), each of the first and second thin film transistors comprising a crystalline semiconductor island (106 and 107 in Figs. 4B and 5A) (col. 6, lines 30 and 42-43), source and drain regions (portions of 118 and 119) (col. 7, line 67 - col. 8, line 2) in the crystalline semiconductor island (106 and 107), a channel forming region between the source and drain regions (portions of 118 and 119), a gate insulating film (a portion of layer 113 in Fig. 4D) (col. 7, line 35) adjacent to at least the channel forming region, and a gate electrode (115 and 116) (col. 7, line 37) adjacent to the channel forming region having the gate insulating film (a portion of layer 103) therebetween, wherein each of the crystalline semiconductor islands (106 and 107) of the first and second thin

film transistors is formed in a monodomain region (106 and 107) which contains no grain boundary shown in Figs. 7 and 12A of current Application, wherein the crystalline semiconductor island (107) of the first thin film transistor (transistor formed in region 111) and the crystalline semiconductor island (106) of the second thin film transistor (transistor comprising gate 115) include nickel at a concentration of about 10^{17} to 10^{20} cm^{-3} (col. 6, lines 63-64) (claim 87), wherein each of the crystalline semiconductor islands (106 and 107) of the first and second thin film transistors comprises Ni (claim 88), and each of the crystalline semiconductor islands (106 and 107) of the first and second thin film transistors is a silicon island (claim 90).

Takemura further discloses that annealing of the semiconductor device (Fig. 4F) is conducted in a hydrogen atmosphere to complete the semiconductor device (col. 8, lines 12-14).

Takemura differs from the claimed invention by not showing that at least one of hydrogen and halogen element is contained at a concentration not higher than 1×10^{20} cm^{-3} in the monodomain region of the first and second thin film transistors, wherein the crystalline semiconductor island of the first thin film transistor includes nickel at a concentration of 1×10^{17} to 5×10^{17} cm^{-3} and the crystalline semiconductor island of the second thin film transistor includes a nickel at a concentration of 1×10^{16} cm^{-3} or less.

It would have been obvious, if not inherent, to the one of ordinary skill in the art at the time the invention was made that hydrogen is contained at a concentration not higher than 1×10^{20} cm^{-3} in the monodomain regions of the first and second thin film transistors due to contamination during deposition of the semiconductor layer and

annealing in a hydrogen environment, because hydrogen is a common contaminant during a semiconductor processing in an air ambient or vacuum, and can diffuse through insulating or metal layers. Further, it would have been obvious to the one of ordinary skill in the art at the time the invention was made that the crystalline semiconductor islands of the first and second thin film transistors may include nickel at a concentration in the claimed ranges, because a concentration of nickel may be controlled to form a high quality crystalline semiconductor island, while reducing adverse effects caused by nickel.

Further regarding claim 87, the claim is *prima facie* obvious without showing that the claimed ranges of the hydrogen and nickel concentrations achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claim 92, Takemura differs from the claimed invention by not showing that the monodomain regions of the first and second thin film transistors have a grain size of 50 μm or more.

It would have been obvious to the one of ordinary skill in the art at the time the invention was made that the monodomain regions of the first and second thin film transistors may have a grain size of 50 μ m or more, because a grain size (a size of region 106 or 107) is larger than a channel length, which may be about 50 μ m.

Further regarding claim 92, the claim is *prima facie* obvious without showing that the claimed range of a grain size achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

5. Claims 91, 123, 124, 126-128, 137, 143 and 149 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura (US 5,534,716) in view of Zhang et al. (US 5,403,772). The teachings of Takemura are discussed above.

Regarding claims 91 and 149, Takemura further discloses that the crystalline semiconductor islands (106 and 107) are obtained from an amorphous silicon film (103) formed using a plasma CVD (col. 6, lines 30-31), the same method for forming an amorphous silicon film disclosed in the current Application (lines 10-15 of page 9 of current Application).

Takemura differs from the claimed invention by not showing that each of the crystalline semiconductor islands of the first and second thin film transistors includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ (claim 91), and the crystalline semiconductor islands of the first or the second thin film transistors include carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ (claim 149).

Zhang et al. disclose a semiconductor device (Fig. 8(A)) comprising a matrix pixel circuit (103) (col. 9, line 61) and a peripheral driving circuit (101 or 102) (col. 9, line 60), wherein a concentration of carbon, nitrogen and oxygen in the active layer is desirable to be less than $1 \times 10^{18} \text{ cm}^{-3}$ (col. 9, line 67 - col. 10, line 3).

Since both Takemura and Zhang et al. teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made that concentrations of carbon, nitrogen and oxygen in the crystalline semiconductor islands disclosed by Takemura may be within the claimed ranges, because concentrations of carbon, nitrogen and oxygen can be controlled to achieve a desired mobility.

Further regarding claims 91 and 149, the claims are *prima facie* obvious without showing that the claimed ranges of the carbon, nitrogen and oxygen concentrations achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art

ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 123, 124, 126 and 127, Takemura discloses a semiconductor device (Fig. 4F) comprising a first thin film transistor (transistor formed in region 111) provided in a matrix pixel circuit (col. 6, lines 12 and 48-49) over a substrate (101) (col. 6, line 16), and a second thin film transistor (transistor comprising gate 115 in region 110) provided in a peripheral driving circuit (col. 6, lines 10-12 and 48-49) over the substrate (101), each of the first and second thin film transistors comprising a crystalline semiconductor island (106 and 107 in Figs. 4B and 5A) (col. 6, lines 30 and 42-43), source and drain regions (portions of 118 and 119) (col. 7, line 67 - col. 8, line 2) in the crystalline semiconductor island (106 and 107), a channel forming region between the source and drain regions (portions of 118 and 119), a gate insulating film (a portion of layer 113) (col. 7, line 35) adjacent to at least the channel forming region, and a gate electrode (115 and 116) (col. 7, line 37) adjacent to the channel forming region having the gate insulating film (a portion of layer 103) therebetween, wherein each of the crystalline semiconductor islands (106 and 107) of the first and second thin film transistors is formed in a monodomain region (106 and 107) which contains no grain boundary shown in Figs. 7 and 12A of current Application, wherein the crystalline

semiconductor island (107) of the first thin film transistor (transistor formed in region 111) and the crystalline semiconductor island (106) of the second thin film transistor (transistor comprising gate 115) include nickel at a concentration of about 10^{17} to 10^{20} cm⁻³ (col. 6, lines 63-64) (claim 123), wherein each of the crystalline semiconductor islands (106 and 107) of the first and second thin film transistors comprises Ni (claim 124), and each of the crystalline semiconductor islands (106 and 107) of the first and second thin film transistors is a silicon island (claim 126).

Takemura further discloses that annealing of the semiconductor device (Fig. 4F) is conducted in a hydrogen atmosphere to complete the semiconductor device (col. 8, lines 12-14).

Takemura differs from the claimed invention by not showing that each of the crystalline semiconductor islands of the first and second thin film transistors includes carbon and nitrogen at a concentration not higher than 5×10^{18} cm⁻³, and each of the crystalline semiconductor islands of the first and second thin film transistors includes at least one of hydrogen and halogen element at concentration not higher than 1×10^{20} cm⁻³ in the monodomain region, wherein the crystalline semiconductor island of the first thin film transistor includes nickel at a concentration of 1×10^{17} to 5×10^{17} cm⁻³ and the crystalline semiconductor island of the second thin film transistor includes nickel at a concentration of 1×10^{16} cm⁻³ or less (claim 123), wherein each of the crystalline semiconductor islands of the first and second thin film transistors includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm⁻³, and oxygen at a concentration not lower than 1×10^{17} cm⁻³ (claim 127).

It would have been obvious, if not inherent, to the one of ordinary skill in the art at the time the invention was made that hydrogen is contained at a concentration not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the monodomain region due to contamination during deposition of the semiconductor layer and annealing in a hydrogen environment, because hydrogen is a common contaminant during a semiconductor processing in an air ambient or vacuum, and can diffuse through insulating or metal layers. Further, it would have been obvious to the one of ordinary skill in the art at the time the invention was made that the crystalline semiconductor islands of the first and second thin film transistors may include nickel at a concentration in the claimed ranges, because a concentration of nickel may be controlled to form a high quality crystalline semiconductor island, while reducing adverse effects caused by nickel.

Further regarding claims 123 and 127, Takemura differs from the claimed invention by not showing that each of the crystalline semiconductor islands of the first and second thin film transistors includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$ (claim 123), wherein each of the crystalline semiconductor islands of the first and second thin film transistors includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ (claim 127).

Zhang et al. disclose a semiconductor device (Fig. 8(A)) comprising a matrix pixel circuit (103) (col. 9, line 61) and a peripheral driving circuit (101 or 102) (col. 9, line 60), wherein a concentration of carbon, nitrogen and oxygen in the active layer is desirable to be less than $1 \times 10^{18} \text{ cm}^{-3}$ (col. 9, line 67 - col. 10, line 3).

Since both Takemura and Zhang et al. teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made that concentrations of carbon, nitrogen and oxygen in the crystalline semiconductor islands disclosed by Takemura may be within the claimed ranges, because concentrations of carbon, nitrogen and oxygen can be controlled to achieve a desired mobility.

Further regarding claims 123 and 127, the claims are *prima facie* obvious without showing that the claimed ranges of carbon, nitrogen, oxygen, hydrogen and nickel concentrations achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claim 128, Takemura in view of Zhang et al. differ from the claimed invention by not showing that the monodomain regions of the first and second thin film transistors have a grain size of 50 μ m or more.

It would have been obvious to the one of ordinary skill in the art at the time the invention was made that the monodomain regions of the first and second thin film

transistors may have a grain size of 50 μm or more, because a grain size (a size of region 106 or 107) is larger than a channel length, which may be about 50 μm .

Further regarding claim 128, the claim is *prima facie* obvious without showing that the claimed range of a grain size achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 137 and 143, Takemura in view of Zhang et al. disclose the device according to claims 91 and 127.

The claim limitation "each of the concentrations of carbon, nitrogen and oxygen is measured by secondary ion mass spectroscopy (SIMS)" specifies an intended use or field of use, and is treated as non-limiting since it has been held that in device claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a "recitation with respect to the manner in which a claimed

apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex Parte Masham*, 2 USPQ 2d 1647 (Bd. Pat. App. & Inter. 1987).

Response to Arguments

6. Applicants' arguments filed November 3, 2008 have been fully considered but they are not persuasive, because independent claims 87 and 123 fail to comply with the written description requirement.

Conclusion

7. Applicants' amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAY C. KIM whose telephone number is (571)270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. K./
Examiner, Art Unit 2815
January 6, 2009

/Jerome Jackson Jr./
Primary Examiner, Art Unit 2815